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SPINA BIFIDA.

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THE TREATMENT

OF

SPINA BIFIDA

BY A NEW METHOD.

BY

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PREFACE.

The interest attaching to the cure of a malformation hitherto regarded as incurable, will be considered a sufficient justification for the reproduction of the following cases in a collected form. In the remarks added brevity has been aimed at, not, it is hoped, at the sacrifice of perspicuity. My best thanks are due to Drs. James T. Whittaker, Andrew Cunningham, and William Muir; also to Messrs. W. H. Woodburn, and Alexander Graham, surgeons, for their cordial and skilful assistance in operating, and

to the pencil of the first-named gentleman am I indebted for the illustrative sketches. Dr. John Caskie, referred to in one of the cases, died two years ago.

James Morton, M.D.

199 Bath Street, Glasgow.

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SPINA BIFIDA.

That imperfection of development to which we apply the name of Spina Bifida is said to be seen perhaps more frequently than any other malformation except harelip. It is unfortunate for those who present this deficiency in the spinal column, that there is is no parallelism as to the comparative safety of the two classes of cases. Harelip does not *per se* prove fatal, while spina bifida almost invariably does so. Spina bifida is usually defined to be a congenital hernia of the spinal membranes, through an abnormal aperture in the walls of the canal.

In this way a tumour is formed, usually of a rounded shape, in the middle line of the back, always fluctuating, often semi-transparent, or translucent, and adhering by a broad basis to the bones of the column. In a few instances they are found to be pediculated. These protrusions are most frequently found in the lumbar region, though we find them also over the dorsal and cervical vertebrae.

It is not my business here to enter upon the subject of hydro-rachitic monstrosities, however interesting and important. Many such, even if born alive, must of necessity soon die; but as we here have to deal with those who possibly may be saved, it may be proper to speak of the anatomy or composition of the tumour, and that under three heads—1, Its coverings; 2, The sac; 3, The contents.

1. *The coverings.*—Writers generally say

that the tumour is covered by healthy skin; and certainly this has been the case in those that I have seen in the very lowest part of the lumbar region; some of these have been so low as to deserve the name of coccygeal. In the majority, however, of those cases which have been presented to me, the skin has been more or less altered, usually much thinned, and hence the translucency. This has been explained in two ways: one theory is, that the skin, at first properly formed, has become thinned as the tumour increased; the other supposes that the skin has been congenitally defective, its place being taken by a thin fibrous material covering the spinal membranes. Some aver that this thin fibrous material is absent in certain cases, and that the spinal dura mater is exposed, and when it is absent the arachnoid is laid bare; I am not sure that this has been verified.

2. *The sac.*—This may be said to consist of the membranes of the cord matted together, its neck is formed by an opening, the result of non-union in the laminae and spinous processes of one or more vertebrae, and is usually short, and the tumour sessile, in botanical phrase, making it seem as if there were no neck. In other cases it is said there is a long stalk or pedicle, but I have not seen any such.

3. *Contents.*—The contents of the sac are, first, the spinal or subarachnoid fluid, an albuminous liquid, more or less watery, alleged by some to contain a saccharine substance, but this requires confirmation; second, a portion of the cord itself, or cauda equina, or some of the spinal nerves. In dorsal cases the cord usually projects into the sac in the form of a curve, and usually this projection is in the middle line, and closely applied to the back of the sac, which

circumstance is worthy of recollection in reference to puncture of the sac.

Absence of the cord, and its prolongations, has been affirmed in certain cases. I doubt if this occurs in what I would venture to call treatable cases, and suspect it is confined to cases in which there is great deficiency of other parts, and, consequently, non-viable cases.

In his work on Surgery, Erichsen, when speaking of the location of these tumours, says: "When it occurs higher up, in the cervical or upper dorsal region, it has been found that the spinal cord and nerves are usually adherent to the walls of the tumour; in the lumbar region this is not the case." We may accept the first part of this statement as probably true, but we must demur to the latter part. It is calculated to convey the idea that the cord is absent, whereas its presence in whole or in part has been de-

monstrated. At the meeting of the British Medical Association in Edinburgh, in Aug., 1875, Dr. Pirie of Aberdeen exhibited a preparation showing the cord traversing the sac, and attaching itself to its walls.

TREATMENT.

Hitherto the treatment of this form of spinal deformity has been the reverse of satisfactory, the subjects of it seldom living longer than a few weeks, usually succumbing either to convulsions or exhaustion. Holmes says, "The progress of the disease is usually to death;" and again, "But, although the great majority of cases are speedily fatal, it is not always so;" and then he refers to the exceptional cases, which, unfortunately, are very rare. In some of these no unpleasant symptom resulted from the tumour, and the patients

died of other diseases, and in some a spontaneous cure took place. Holmes further says: "Active surgical treatment usually hastens death, yet cases have been known to recover after many varieties of operation. It is this fact which makes the interest of the disease, and renders the surgeon anxious to separate from each other the cases which should be left alone, and those which should be treated actively." After affirming also that the presence of the cord, and the free communication of the sac with the spinal theca, are the great obstacles to the success of operations, he continues: "Now, as every true spina bifida communicates freely with the spinal theca, and, as a very large majority of those of the common form (in the lumbo sacral region) contain the cord or nerves, no further argument is required to prove the expediency of abstaining from active interference." He then advises pro-

tection and watching, "in the hope that the disease may remain stationary, perhaps even undergo a spontaneous cure," and continues by inquiring "What course is to be pursued in cases where the tumour is increasing rapidly, and where the thinness of ulceration of the skin proves that the sac will soon burst; or where it has burst and the infant has survived;" and, further, proceeds to speak of convulsions and paralytic cases, to which I shall afterwards refer.

As in medicine, when diseases are incurable, the remedies proposed are almost innumerable, so in surgery, when a condition presents itself which is very unmanageable, the modes of procedure recommended are nearly as numerous. We shall not pretend, therefore, to refer to all the proposals which have been ventilated; but shall now advert to what may be styled the various forms of operative procedure which have been tried.

Operations may be either palliative or radical. Among the palliative may be named pressure, although the name of operation can hardly be applied to it, which has been proposed to be gradually and cautiously applied. We have heard of no good results from it, and fear it would be likely to hasten the bursting of the sac, and the mischief invariably attendant upon this. Repeated tapping with a fine trocar, followed by pressure, is said to have been followed by two successes in the hands of Sir Astley Cooper. The application of collodion, or collodion diluted with castor oil, when the skin is thin (though it is not easy to discover a reason for the dilution), is said to have succeeded along with the administration of calomel.

RADICAL OPERATIONS.

Attempts at a complete cure have been

made in a variety of ways, and may be thus classified—1, Ligature; 2, Excision; 3, Injection.

1. *Ligature.* — Instant strangulation of the pedicle or base of the tumour is said to be always fatal, and that has been proved by frequent trials. Gradual compression, as by clamp or quills, or even a ligature tightened by degrees, seems more feasible, yet has not obtained much favour, and is admitted to be far more dangerous than injection. This method has been combined with excision in some instances, the latter succeeding the use of the ligature or clamp.

2. *Excision.*—With the knowledge now possessed of the anatomy of this malformation, surely no one would think of excising the sac; and yet we are told that it has had a few successes. Even the ecraseur is named as having been employed with suc-

cess, but the patient was fourteen years of age, and recovered without a bad symptom.

Several methods of performing the operation of excision have been described, some of them ingenious and careful, but in none do I note any proposal having for its object the prevention of escape of the cerebro-spinal fluid; and most of them seem to proceed upon the assumption of the absence of the cord or nerves. It will also be observed that writers on this point make a good deal of the condition of pedunculation, a condition which I suspect to be extremely rare. This statement is founded upon the fact that I have now seen a considerable number of cases of spina bifida, and none of them were pedunculated, but all sessile, or attached by a broad base. This remark applies alike to cervical, dorsal, and lumbar cases, and the latter, the most amenable

to treatment, are least likely to be pedunculated.

3. *Injection.*—This mode of aiming at the radical cure of spina bifida seems to me the least liable to objection, and has been taken up last because concerning it I have most to say. The profession has for a long time back considered it as the most likely to prove successful, and experience has shown that it has been much more fortunate than either ligature or excision, if not more fortunate than both put together. Iodine has been the substance chiefly used, sometimes the tincture, sometimes other solutions. Velpeare injected with tincture of iodine and water, after emptying the sac like a common hydrocele: hence this is called the French method. The American surgeons draw out a certain amount of the fluid in the sac, and supply its place by the iodine solution; but some operators, such as Brainard

of Chicago, withdraw this mixture after a few minutes. He thus describes his own operation :—

BRAINARD'S MODE OF OPERATING.

"A small-sized hydrocele trocar was carried into the tumour at its base on the right side, and six ounces of fluid drawn off; while this was flowing, pressure was made by an assistant, and as the sac was emptied the pulp of the thumb was pressed upon and partly into the opening in the spine, which it exactly filled, so as to close it as perfectly as possible. Half-an-ounce of a solution (five grains iodine, fifteen grains iodide of potass to the ounce distilled water) at the temperature of the body was then injected through the canula, and after a few seconds allowed to flow out; distilled water at the temperature of the body was thrown in to

wash out the iodine, and two ounces of the fluid first drawn from the sac, and kept at the same temperature, were reinjected, and the canula withdrawn. From movements of the child some bubbles of air passed into the sac, and as these could not readily be brought out, they were left."

I had read this before entering on the treatment of my first case, but thought it then, as now, quite inadmissible. It appeared to me a very hazardous mode of proceeding, and, as I hope to show, unnecessarily so. In very few cases could the half of *six* ounces be drawn off, so that I suspect that the description applies not to infants a few weeks old. Nothing is more certain than that the complete removal of all the fluid in the sac is in the highest degree dangerous, if not absolutely fatal. The employment of chloroform must also add to the danger; it ought not to be given

in the case of very young infants, if at all, in any case of spina bifida. I say *if at all* advisedly, for the pain inflicted is but slight, and whatever materially affects the brain and nervous system ought to be withheld.

NEW METHOD.

This is substantially a mode of injection, but a new fluid is used, now called the iodo-glycerine solution; and under certain precautions, the most important of which is the prevention of the continuous loss of the subarachnoid or cerebro-spinal fluid, which must be regarded as essential to the integrity of the spinal cord, being a necessary part of the contents of the spinal canal. The iodo-glycerine solution is named so from its components, which are, ten grains of iodine and thirty grains of iodide of potassium. dissolved in an ounce of glycerine. The quan-

tity employed in any case will depend upon the size of the tumour to be operated on.

A medium-sized trocar and canula should be used, chiefly because the iodo-glycerine solution, not being a thin fluid, will not pass readily through a very small canula.

More detailed remarks on the mode of procedure will follow the cases, as the experience gained in conducting these has been suggestive of various slight modifications in regard to minor matters of management. Let me here repeat, however, that what occurred to me as the chief defect of former operations, was the absence of any provision for preventing the loss of the spinal fluid.

Case I.

Abstract of a Clinical Lecture published in the "British Medical Journal," 6th April, 1872.

John Kelly, aged 2 months, was ad-

mitted into ward 17 of the Glasgow Royal Infirmary on October 2nd, 1871. This child had a tumour opposite the upper lumbar vertebrae, globular in shape, of about the size of a small orange, and presenting the usual appearances of a case of spina bifida. Its covering was thin, so that it was quite translucent; and at the child's birth it was about half its present size. The mother stated that the tumour felt harder and fuller when the child cried. Moderate pressure upon it did not cause much inconvenience or suffering; and the child never had convulsions, and seemed in all other respects quite healthy; the fontanelles being neither more open nor more full than usual at the same age.

On October 12 the tumour was punctured with a grooved needle, and rather more than half of its contents—a pale straw-coloured fluid—was removed. It was then

covered with lint dipped in oil, and over this cotton-wool; and, to fix the whole and afford a slight pressure, a broad elastic band was passed round the waist of the child. The sac speedily refilled, and on the 18th it was punctured a second time, and again it refilled.

On the 24th October the tumour had regained its former size; and to-day it was punctured with a moderate sized trocar and canula. After it had been half-emptied, a small portion — probably nearly half-a-drachm—of the following solution was injected:

℞ Iodi qr. x; Potassii ʒss; Glycerine ℥l.

On October 26 the child continued well, having no bad symptoms, and being only a little "fractious." In the swelling a portion of a soft substance could be felt rather to one side.

On November 2 the mother was allowed to take the child home for a day or two; on the 6th she returned to the Infirmary, when it was evident that some degree of refilling had taken place. The tumour was again injected with a small portion of the iodine solution. How much actually entered the sac it is impossible to say. The child, however, continued quite as well as before; and on November 23 he was again brought up and shown to the Clinical Class, when the tumour was found to be smaller and harder than formerly, without any appearance of redistension with fluid.

On December 7 the child was again shown at the hospital, and now the swelling presented the appearance of a shrivelled bag of skin, darker in colour than the adjacent integument, somewhat resembling a corrugated scrotum, and affording reason to believe that there was now complete closure

of the opening of the spinal membranes. The health of the child was perfect, his mother affirming that he never was so well and comfortable as he was now.

On January 8, 1872, the child was again brought to the hospital, merely to show that he continued quite well.*

Remarks.—In commenting on this case before the Clinical Class, a short account was given of the usual appearances presented by such tumours, and the ordinary coverings and contents were noted. Reference was also made to the deficiency in development of the osseous portion of the spinal canal, as the origin of the name, which of itself conveys no idea of the importance of the contents; and remarks were further made to the following effect:—It is

* The patient was shown to the members of the Medico-Chirurgical Society at their meeting on the 1st of February last (1872).

in reality a local dropsy, consisting of a collection of serum within the serous covering of the spinal cord; and, too often for the safety of the patient, there is also a portion of the nerve-structure of the cord, which has left its proper line and lies extended under the serous lining of the sac, just under the skin, running, as it were, round or half-round the circumference of the swelling, which is often globular, as in this instance. It is this condition chiefly which renders interference with such cases hazardous, and which presents, to the mind of the surgeon, the possibility of the nervous matter of the cord being so disturbed, as to lead to very violent and dangerous manifestations of the effects of irritation of such tissues, in the form of convulsions, which not seldom, terminate fatally. Even when left to nature, the rule seems to be, that the subjects of such malformations die, and that

early—within the first or second year. To this it is well known there are exceptions, still it is the rule. Attempts are usually made by relatives, under professional advice, to protect the part by the use of hollow cup-like shields, lined with cotton, and most carefully attended to; but the result is disappointment, so far as life is concerned. These tumours are far more common in the lumbro-sacral region than in all the other portions of the spine put together; and this is an example of one in the lumbar region.

Treatment.—Allusion has just been made to the palliative or protective treatment, as we may venture to call it; and we now turn our attention to the modes of attempting the radical cure, and give shortly our reasons for adopting the plan which has been so fortunate in the present instance. Though it may be true that active surgical interference usually hastens death, yet cases have

recovered after various kinds of treatment. The presence of the cord, and the free communication with the serous covering of the spine and brain, are the chief obstacles to success. Inflammation of the cord or its membranes, and gangrene of the cord, causing paralysis, may occur, speedily ending in death. Even when left untouched, the skin often ulcerates, the sac bursts, and palsy and convulsions cause death. A spontaneous cure has been known to take place, the orifice of communication having closed, the tumour becoming a closed cist, and remaining innocuous, or, it may be, removed. Rupture of the sac has even been followed by recovery. Three modes of interference present themselves — 1st, Injection; 2nd, Ligature; 3rd, Excision; and of these three modes it may be said that each of them has been effected by a variety of means and appliances, which it is not my purpose to

enumerate at present. Suffice it to say that I resolved to adopt the first of these, as, in my opinion, the least dangerous of the three. It will be noticed that twice I punctured the sac with a grooved needle, and drew off a considerable quantity of the fluid. These may be called tentative measures, to ascertain whether the membranes could be pierced with safety; and, no suffering or derangement of function having followed, I felt encouraged to use an *iodine* solution of some density. Not that I for a moment imagined that it could not be conveyed along the serous cavity or the serous lining of the spine; still, to my mind, it offered one element of greater security. In forming this solution, I resolved to use glycerine as a solvent; for this reason, that it is a fluid of less diffusibility than a spirituous or even a watery solution. The strength of the solution may be noted, but then it

must be observed that, in using it, the sac was purposely only half-emptied of its serums when the iodine solution was injected, so that the then iodurretted contents of the sac presented a very dilute solution. When the repetition of the injection was made, somewhat more of the iodine solution was used; but part of it escaped and was lost, so that, as the report states, it was not possible to correctly estimate the amount retained. A degree of solidification followed the first injection; and after the second it became complete, and now remains so, the part admitting of ordinary handling without inconvenience or discomfort to the child.

A line of treatment very similar to this has been followed by several of the American surgeons, and with instances of success; but statements are discordant with regard to the proportion which the successes bear

to the failures. Several British surgeons have also operated successfully in a limited number of cases and by various methods, and most frequently by injection with iodine as the coagulating or stimulating agent, but I am not aware of glycerine having been used as the solvent on any previous occasion, and I may indulge the hope that others may be induced to try it.

From what I have seen of such cases, it is my belief that the fluid should not be allowed to be drained away completely from the sac: this leads to fatal results; and, where a puncture has been made, the aperture, however minute, may be closed and guarded by a layer or layers of collodion, especially when subsequent oozing is feared or perceived.

Case II.

The child who is the subject of the

following report was brought under my notice by Dr. Robert Grieve of this city, about fourteen days after its birth; the most prominent part of the tumour was then slightly ulcerated. The mother was directed how to defend it and dress it properly. The following report of it was written by my assistant, Mr. John Caskie :—

Ann Ross, aged two months, had a tumour situated over the lower lumbar vertebrae. At birth it was small, but had gradually increased in size. Some time ago it showed signs of ulceration; but these healed up, leaving thickening and cicatrices of different colours. On admission the tumour was as large as a middle-sized orange, and cylindrical in shape. At some parts it was reddish, and at others bluish in tint. It was semi-transparent, fluctuant, and somewhat wrinkled on the surface. It became tense when the child cried. On looking

through it several striæ were seen passing over its internal surface. On March 27, 1872, it was tapped with a grooved needle, and about three ounces of a fluid resembling cerebro-spinal were drawn off. The child did not suffer; and, as the fluid continued to exude, the opening (which was made upon the right side towards the top) was closed by means of collodion. On April 1 the child was in fair condition, had no diarrhœa, took the breast well, and was in all respects healthy. On April 2 the tumour was again tapped, and about two ounces of fluid were drawn off. After the tapping the fontanelle was depressed, but by night it was again normal. The child continued well, and no leakage took place. The tumour was dressed with a small piece of oiled lint. On April 5 the tumour was tapped with a small trocar and canula, and half its contents were drawn off. About two drachms of a solution of

iodine in glycerine were slowly injected, and the tumour was dressed with oiled lint. The child suffered a little from shock at first, but soon recovered. It continued well during the day, taking the breast well. The fontanelle was for a time depressed. At night the tumour was half-filled, and the fontanelle was nearly nominal. The lower limbs were found, on examination, to be quite normal, as regarded colour and temperature. On April 6 the tumour was about three-fourths of its former size. The contents were thicker, but no distinct coagulation had taken place. The child continued well. On the 8th slight ulceration was observed over the top of the tumour. It was diminished in bulk, and was now only half its former size. The child had complete power over the lower limbs, and was well. The tumour continued to diminish; and on the 16th consolidation had taken place at the

upper portion, and the other parts felt firmer than formerly. The ulceration had not increased, but there was slight discharge of pus from under the skin that covered it. On the 25th the tumour was nearly on a level with the surrounding skin, and only distinguishable from it by its livid colour. Over its centre there was a small triangular depression, from which a small slough was taken by Dr. Morton. The child was in all respects healthy, and had complete power over its limbs.

On the 6th of April last, in the *British Medical Journal*, there is an account of the first and only other case which I have treated in the manner here noted, so that both have been successful. The composition of the iodine solution will also be found there stated. The procedure adopted may be here restated thus: 1. Two tentative tappings are made with a grooved needle,

with an interval of four or five days between each. 2. The tumour is tapped with a small trocar and canula, allowing about half the contents of the sac to escape, and about a drachm of the iodine solution is injected; rather more was used in this case, but I think less might have sufficed. The after treatment may be said to consist in dressing with some bland substance, as oil or lard; cleanliness and care, so as to avoid local injury or irritation.

Prevention of the complete escape of the cerebro-spinal fluid I believe to be of the greatest importance; hence the use of collodion in this case, which answered the purpose admirably. The presence of this fluid is essential to the functional, if not to the structural integrity of the spinal cord and brain; and when it is allowed to drain away the child speedily succumbs. On this point I can speak with some experience;

besides, soon after treating the case already published, a child was sent into the Infirmary having a similar tumour in the dorsal region, which was punctured by the grooved needle, but not injected, the spinal fluid continued to exude, and from this alone the child sank and died. The idea of using the collodion did not occur to me till too late, but this mishap caused me to direct my assistant to watch the case now given, and use the collodion if necessary, and it forms an apt illustration of the success of such a mode of closing the puncture; after the second puncture the collodion was not required.

To my mind the satisfaction attending the success of this case is enhanced by the circumstance of its being the second of two cases treated in precisely the same way; and these the only two treated by the injection of the glycerine solution, which I

was induced to adopt, as being less diffusible than a watery or spirituous solution.

How far this mode of treatment may be applicable to the cases in which the congenital defects exist above the lumbar region, I will not at present endeavour to define, but surely it is not too much to say, that if by it we can save lives when we have a lumbar tumour to deal with, we are not to be debarred from attempting to deal with those in the dorsal or cervical regions, provided the extension of our line of operations be prudently conducted.

Case III.

Treated by Dr. Watt, and published in the "British Medical Journal" of April 26, 1873.

The following case of spina bifida occurred in my practice some time ago, and was considered an excellent opportunity for testing

Dr. Jas. Morton's method of treatment by the injection of a solution containing ten grains of iodine and thirty grains of iodide of potassium in an ounce of glycerine: this, with Dr. Morton's cases, make three treated in this manner, all of which have been successful:—

On June 18, 1872, Mrs. M'R., an anaemic woman, was delivered of her third child, a small and weak boy of full time. In the position of the 3, 4, and 5 lumbar spines was a sessile, semi-transparent, flesh-coloured, fluctuating tumour, as large as an ordinary sized hen's egg, and so sensitive that simple contact with the finger brought on fits of crying, during which the investing membrane became very tense. On firm pressure with the finger, a vacant space, bounded at the sides by bony ridges about half-an-inch apart, was found in the usual position of

the vertebral spines; and, when viewed by transmitted light in a darkened apartment, cords were seen passing near the surface. A pad of cotton-wool was placed over it under a firm binder, and the child was daily seen for a week. It moaned almost constantly, slept little, and took the breast badly. Its legs dangled, and no voluntary attempt was made to move them—slight movement of the toes being the only reflex action from tickling its soles, and the sphincters seemed very weak.

On August 2 the tumour was much larger, measuring eight inches in circumference. The most prominent part was ulcerated superficially; the lower border overhung the sacrum. Two drachms of clear fluid were removed by Wood's syringe (which was used throughout), care being taken to avoid the nerve-cords. The cotton pad and binder were replaced; and the child was ordered to have

half-a-teaspoonful of spirits in water every three hours.

On August 3 the tumour was one-half less; from the needle aperture drops of clear fluid still oozed, and from the soaked condition of the pad and binder a constant escape must have been going on. The child looked much exhausted, but had had no convulsive symptoms.

August 11.—The tumour was as large as before interference. From its upper edge, a second quantity of two drachms was removed. The child was kept with the face down upon the nurse's knee, with the back uncovered; and the aperture closed in a short time.

August 17.—A third quantity of two drachms was removed, and half-a-drachm of Dr. Morton's solution was injected. The child cried immediately. The spirits and water was continued.

August 18.—The child had slept very little, and appeared very weak. The tumour was unchanged in size, and along the left border a faint blush was present, which faded in a few days.

August 26.—The tumour was slightly decreased; the membranes were lax, and the fluctuation was less distinct.

September 13.—The tumour was nearly level with the back, and was replaced by a large half-dried resistent scab. The child was firmer; the legs never moved together, but when the soles were tickled one or other leg was drawn up a short distance. The sphincters were more under control.

February 21, 1873.—A cake of firm condensed tissue occupies the site of the tumour. The child was much grown, plump and thriving. It may be remarked that, even although the tumour and the cavity of the spinal membranes communicated, as

shown by the nerve cords in view, and the greatly depressed fontanelle after the first withdrawal of fluid, yet no irritation spread along the cord from the injected solution, and the result must be considered successful.

Case IV.

Treated by Dr. Watt, and published in the "British Medical Journal," Jan. 31, 1874.

This woodcut,* from a photograph, represents E G., aged three years, as she was brought to me in April last, and therefore conveys a correct idea of the size and situation of a spina bifida tumour, which, wholly covered by true skin, stood out with a prominence of nearly four inches, and measured thirteen and a-half in circumference. It was very sensitive to the touch, became tense

* Two woodcuts were shown.

To Face Page 38

when the child cried, and palpation discovered a perfectly fluid condition of its contents. It was slightly pendulous when the child was erect, and gave her a ludicrous, although at present rather fashionable, appearance when dressed — the projection at her age being unlooked for.

Her mother stated that it was like a walnut at birth, and had increased gradually; that she walked at two years; was now active, although not firm on her legs, and easily knocked over; that she enjoyed excellent health, but was constantly annoyed by escapes from the bladder and rectum; and that she had always been advised to let it alone.

The treatment of this—my second successful case—was by the same method as that described in the *Journal* of the 26th of April last, viz., by injection of Dr. Jas. Morton's solution of iodine and iodide of potassium in

glycerine, and was briefly this:—Two tentative tappings with a medium canula, of respectively twelve and ten ounces of clear fluid, were made, with an interval of eight days, both being followed by an irritable and feverish condition of the child, and gradual refilling of the tumour to its original size. Ten days afterwards, other ten ounces were removed, and half-a-drachm of the solution injected. The opening was instantly closed on each occasion by a layer of lint soaked in flexile collodion. This last operation in a few days made the tumour tender, and caused the child to be feverish, restless, and extremely excitable, with decrease of appetite, milk and soups alone being taken. Ten days after the first injection the tumour was very slightly less, and eight ounces were then removed, followed by the injection of half-a-drachm of Dr. Morton's solution. This gave rise to

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even more severe irritative symptoms of the nature described; but a fortnight later showed the tumour only one-third of its original size, although still sensitive and painful when interfered with. At that time about five ounces were removed, followed by a third injection of half-a-drachm; this caused cessation of any further formation of fluid, and a gradual absorption began which, at the end of twelve weeks from the first interference, presented the appearance conveyed by the second woodcut—a roughened, darkened, hardened, and thickened condition of skin, quite normally sensitive to the prick of a needle, replacing the tumour and closing the spinal aperture with an apparently gelatinous mass.

The treatment extended over nearly seven weeks, and the measured fluid removed amounted to forty ounces—a larger quantity, to my knowledge, than from any previously

successful case. Half-a-drachm of the solution was deemed sufficient for each injection, owing to the large extent of the sensitive surface to be dealt with; and the irritative symptoms developing therefrom quite justified the precaution taken.

This, my second case, with Dr. Morton's, make *four* successes, all that have been so treated; and, without appearing too confident of further success, the result is very hopeful and gratifying to the introducer of this method of treatment.

The patient is now very active on her feet (amusing herself, and standing as much consequent fatigue daily as her healthy companions), growing rapidly, and the sphincters are now almost wholly under control, cold sea-water baths being persevered with.

Case V.

As reported in the "British Medical Journal" of October 24, 1876.

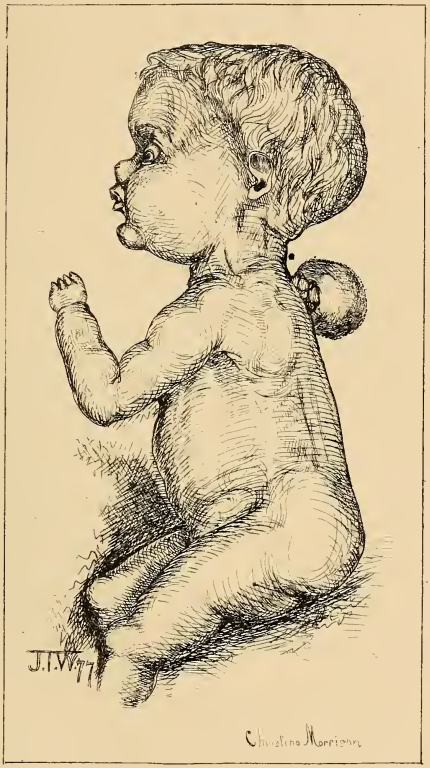
On two former occasions I recorded in the pages of the *British Medical Journal* two cases of spina bifida in the lumbar region, both cured by injecting the iodo-glycerine solution, which I employ; and subsequently my friend, Dr. Watt of Ayr, has narrated other two cases treated by the same method and the same liquid, and terminating equally happily.

I have now the pleasure of recording an equally fortunate result in the case of a child presenting a similar deformity, or rather a similar congenital defect, in the upper dorsal region.

On June 22 Dr. Thomas Smith asked me to see a case of spina bifida with him. The patient, a little girl named Christina

Morrison, aged seven weeks, was rather delicate, and did not seem to be thriving as well as the mother could wish. The tumour, which was present when the child was born, was globular in shape, about the size of a peach, not pedunculated, elastic, and semi-transparent. It was situated rather high up, being immediately over the seventh cervical and first dorsal vertebrae, and, as a consequence, greater care was required in its treatment. It was said to have burst, and a quantity of clear fluid to have escaped. The opening seems to have closed; and, the fluid accumulating, the swelling became larger than ever. Some time before the case was brought under my notice, the child was presented in the wards of a large surgical hospital, but nothing was attempted in the way of cure or treatment.

June 23.—The tumour was tapped by means of a fine trocar and canula, and a



This Figure shows the Tumour both before and after Operation.

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quantity of fluid drawn off. At this tapping, a small quantity of the iodo-glycerine solution was injected, and the puncture carefully closed by means of collodion. Besides a little paleness, no appearance of shock was manifested, the child speedily taking the breast. Towards evening the child became restless, and did not sleep during the night. It cried occasionally. As the morning wore on it became calmer, and then had a refreshing sleep. The fluid again accumulated, showing that the injection had not fully answered my purpose.

On July 3 the tapping and injection were repeated. This time no effect was produced upon the child. It took the breast, and slept soundly and well, and, in fact, behaved as if nothing had happened more than usual. A good deal of serum and blood escaped after the injection, and it was with much difficulty that I could get the puncture closed. This

I ultimately managed by means of a cotton rag soaked in collodion.

July 25.—The child was visited to-day, and the mother said that ever since the last operation the child had done well; the tumour gradually diminished in size, and the health of the child was greatly improved. It has complete power over its limbs, and seemed to delight in using them. The mother remarked that "the bairn" never enjoyed such good health. The tumour was about the size of a large strawberry, and of light purplish colour. It was quite solid. The surface was irregular and puckered up, something like a child's scrotum which had been exposed to cold; or, rather, like a bulky raisin. On August 18 the child continued well.

This case, and the other four to which allusion has been made, are the only cases which have been subjected to this mode of

treatment, and all have proved fortunate. Though the cases are still few, the uniformly successful results are most encouraging, and may induce others to try and increase the number of cures. Success in every instance it would, I fear, be Utopian to expect; but if success become the rule and failure the exception, this mode of treatment may be held to be the safest hitherto made known in the management of such a dangerous congenital malformation.

Case VI.

As reported in the "British Medical Journal" for April, 1875, *by Mr. Angus of Newcastle.*

Having lately cured a case of spina bifida, on the plan advocated by Dr. Morton of Glasgow, I beg to add my testimony in favour of his treatment. On November 1, 1874, I attended Mrs. T., in labour with

her second child, which was born a few minutes after my arrival. It was a plump well-nourished boy. Over the three upper lumbar vertebrae was a tumour, of the size of a peach, which had ruptured with the expulsive efforts of parturition, and part of the contents had escaped from the sac. Careful that too much fluid should not drain away, I applied a pad of cotton-wool over the opening, and a broad binder. Two days afterwards it had partly refilled, and, when the child cried, became tense. It was semi-transparent, and had a pinkish appearance, except at the upper part, where, on each side, there was a bluish spot, about the size of a sixpence, which, the mother remarked, were like two eyes. The child cried whenever firm pressure was made over the tumour. The nature of the case having been explained to the parents, they were anxious for the operation to be done. On November 19 I

punctured the sac with a grooved needle, and drew off part of the fluid, a cotton-wool pad and binder being applied. The operation was repeated four days afterwards. On neither occasion did the child suffer from constitutional disturbance. On the 28th, after drawing off half the contents through the needle of a subcutaneous syringe from the bluish spot, at the upper and left side of the tumour, I injected through the same needle half-a-drachm of the iodo-glycerine solution (previously warmed at the fire to liquefy it). Flexile collodion was painted over the minute opening, and a piece of lint dipped in olive oil, with a pad of cotton wool laid on it; the binder firmly securing the whole. The child cried lustily after the operation, and in about ten minutes suddenly turned pallid in the face, the nurse exclaiming that it was dying. Fifteen drops of brandy in a teaspoonful of water were

given, and the little fellow was soon sleeping soundly in his mother's arms.

Gradual thickening of the contents took place, and on January 4, 1875, complete consolidation was present in every part, except the bluish spot on the right side, where a little fluctuation was felt. Fifteen drops of Dr. Morton's solution were injected into it with the subcutaneous syringe; and by the end of the month the cure was complete. The child is now (March 20) in good health, the only appearance noticed on the back being a corrugated and hard condition of skin over the site of the former tumour.

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The following was read as a communication to the Surgical Section of the British Medical Association at the annual meeting in Edinburgh, August, 1875.

Previously to October, 1871, it was the

habit, with others as well as myself, to regard cases of spina bifida as hopeless, and to discountenance the idea of surgical interference. It was well known that they had been dealt with in a variety of ways, some of these reckless and rash, others more or less prudent, almost all proving in the end unfortunate. It was also known that in some few instances a spontaneous cure had taken place, but these were truly, like angels' visits, few and far between. It was universally admitted that very many died, in truth by far the greater number, the precise numerical proportion being difficult to arrive at; the conviction being general that only a very small per centage lived for any great length of time. As a proof of this the prognosis usually given was a very hopeless one, and seldom falsified by the result.

So entirely had this view of the malforma-

tion taken possession of practitioners, that it was the custom to limit their efforts to what was called the palliative treatment, such as protection or defence from injury, carried out in various ways, so as to avoid ulceration and bursting of the sac, with its fatal ending. Up till the date mentioned I was a follower of the do-nothing system; but on October 2, 1871, a case was presented in the Glasgow Royal Infirmary, which prompted me to reconsider the question, more especially as the child was otherwise healthy, and I felt a strong desire to give it a chance. On turning my attention to the numerous methods previously employed, too numerous to mention here, it appeared to me that injection was the safest, as that could be effected without permitting the complete escape of the fluid contained in the protrusion. The kind of fluid to be injected next demanded consideration, when it oc-

curred to me that a solution of iodine, less diffusible than either a spirituous or watery solution, would best suit my purpose, as being less likely to permeate the cerebro-spinal fluid with rapidity, and therefore less likely to cause shock or bring on convulsions. With these views I caused the following solution to be prepared, which is now known as the iodo-glycerine solution:

℞ Iodi x qr.; potassii iodidi xxx qr.; glycerine j℥.

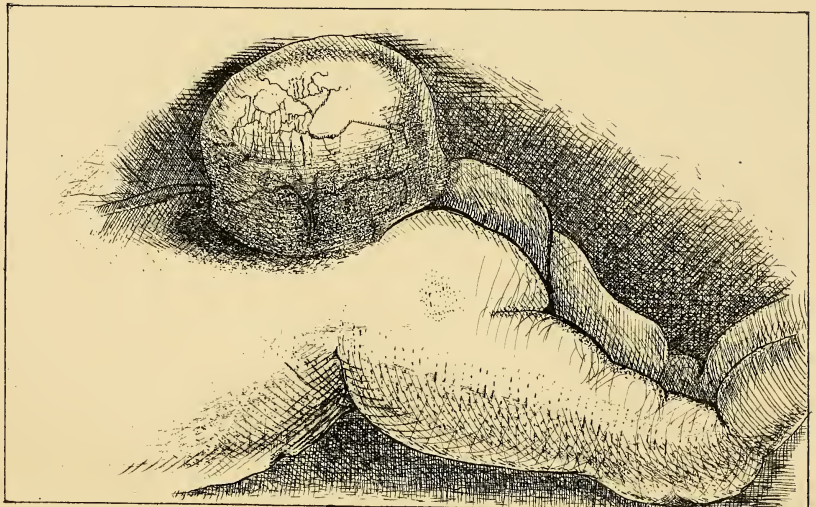
From half-a-drachm to two drachms of this fluid have been used, according to the size of the spinal protrusion.

Previous to injecting, I considered it prudent to make a tentative puncture, to ascertain whether such interference would be tolerated, and followed this course in the first case and most of the others. To close the openings made both by grooved needle and by trocar, collodion and flexible

collodion have both been used, and have served the purpose, so that either may be employed. This mode of treatment was first employed by me in October, 1871, and the details of the case are given in the abstract of a clinical lecture which appeared in the number of the *British Medical Journal* dated April 6, 1872, after having been shown to the members of the Glasgow Medico-Chirurgical Society on February 1 of that year.

The second case was shown to the same Society on May 30, 1872, and was published in the journal named on June 15 succeeding.

Dr. J. R. Watt, of Ayr, successfully followed the same plan in two cases; one of which appeared in the *British Medical Journal* of April 26, 1873, the other in that of January 31, 1874, with a well executed photograph of the patient after cure.



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Another case treated under my own care is published on October 24, 1874, in the same journal. More recently a case has been treated by Mr. Angus of Newcastle, which appeared in the *Journal* for April 17, 1875; and in a private note with which he favoured me, he expressed his confidence in the method employed if conducted with due care.

Since the beginning of this month (July, 1875) I have treated another case with the like good fortune, and without a disagreeable symptom. The fluid was twice analysed by Professor Ferguson of Glasgow, but gave no indication of the presence of sugar.

During the past winter a large cervical spina bifida was presented to me, which was several times injected without any appearance of shock or suffering, but it ultimately succumbed to convulsions caused by the continued escape of the subarachnoid

fluid. The domestic circumstances of the mother demanded her presence at home, and unfortunately she was allowed to leave the hospital with her child, and the following night the mischief took place; and, though the flow was stopped, it had already prostrated the child. Every reasonable effort was made to obtain a *post mortem* examination, but without success. I may mention that several analyses of the sub-arachnoid fluid withdrawn from the child were made, resulting in doubtful indications of the presence of sugar, or of some glucose matter which reduced copper oxide. At present I have under consideration another instance of this defect in the lumbar region; the child is about ten days old, and it has not yet been interfered with.

But the question may be put: How is the cure produced? or, What is the *modus operandi* of this solution when injected?

The reply which most readily suggests itself is, that it is analogous to the process occurring in the tunica vaginalis, consequent upon the operation for the radical cure of hydrocele.

Though the quantity of albumen in the subarachnoid fluid is small, a coagulum seems to form; adhesive lymph may be produced or deposited, and, at all events, arrest of further collection of fluid results from successful injection. This may be accompanied, or followed, by closing of the opening or channel of communication between the spinal canal and the protrusion.

The anatomy of this defect at once presents itself as a matter for consideration; and, on this point, I have made some inquiry, and have been rather disappointed to find that anatomists of very prolonged experience had little or nothing to offer me in the way of personal observation of its dissection.

Figures of the parts have been given in books, with appropriate descriptions. All authors seem to agree in the local deficiency of the spinal canal, and the protrusion of the covering of the cord, containing a quantity of the spinal fluid and the cord (or portions of its immediate branches), though it has been affirmed that occasionally the latter is absent. I am not aware upon what evidence this statement rests, and meantime prefer to believe in its presence, while awaiting further investigation.

Such belief may induce caution in treatment, though it need not lead us to doubt the possibility of cure, as a recent writer in the *British Medical Journal* seems to do. To assume the absence of the cord, or parts of it, in seven consecutive cases, is so entirely beyond the range of probability as to be altogether inadmissible, while possibly it was present in all. At the same time

I shall feel personally indebted to any one who may procure authentic information on this point, such information as may amount to a demonstration or dissection of parts. I am able to show you here a dorsal case, or rather a preparation of it. The child died, exhausted by the escape of the cerebro-spinal fluid; no attempt having been made towards cure. The cord is seen projecting into the tumour, and attached to its walls. I am glad to say that as yet I cannot show an injected case, that is, a dissection of a case after successful injection, however much that may be regretted in an anatomical point of view. On this point authors write very much as follows, which can be seen in Dr. Churchill's work on *Diseases of Children*, and there given on the authority of Dugès: "The condition of the spinal marrow is of considerable interest. Ollivier states that, when the case is not complicated with

hydrocephalus, he has generally found the spinal marrow traversing the sac unaltered, except that in some cases it seems lengthened. But if coexistent with hydrocephalus, or if the canal of the spinal marrow be distended with fluid, the cord may be flattened out, as it were, so as apparently to line the sac. In some few cases," continues Dr. Churchill, "the spinal cord seems to have left the canal, and to be contained within the tumour, forming what some authors have properly called hernia of the spinal marrow. This happens only when the deficiency is at the lower end of the spine."

In a lecture on pathological anatomy published in London this year, Drs. Wilks and Moxon write: "A funnel-like depression or umbilicus on the middle of the tumour, will generally signify the point of insertion of the spinal cord on the walls of the sac." This is worthy of recollection by those about

to operate. There is evidently some variety in the position of the cord and the distribution of its branches.

The statistics of the operation at the present time are the following:—This mode of injection has been employed in ten cases. Of these seven have been successful, and entirely so; the cases being uncomplicated by paralysis or any other deformity, and, so far as known to me, remain well.

Of the other three, one has been already referred to as dying from a preventable cause *(Case* 8*)*, a well known danger; another occurred in the hands of Dr. Watt *(Case* 9*)*, who states that the child was otherwise diseased at the time; and the third is the case published by Mr. Burton at Liverpool *(Case* 10*)*, manifestly a case in which the spinal protrusion was but a small part of the whole deformity; though, seeing the child *in extremis*, he considered it his duty to

give it even a forlorn chance. We are thus in the position of recording 70 per cent. of cures, and at the worst 30 per cent. of mortality; and, when we revert to the past history of spina bifida, such a result is sufficiently gratifying. I ought to add, however, for the encouragement of others, that all my own lumbar and dorsal cases have proved fortunate hitherto; that they will always do so I am not sanguine enough to expect, though I can now approach their management with less misgiving. I have been exceedingly pleased to find that this method of treatment has succeeded in the hands of others, and have to thank Dr. Watt and Mr. Angus for the publication of their cases.

In managing a case of spina bifida the following points are important:—

1. The child should be in a thriving condition.

2. Make a tentative puncture with a grooved needle.

3. Draw off not more than half of the fluid contents.

4. Carefully close the puncture by collodion or otherwise, so as to prevent further escape of fluid.

5. When proceeding to inject, use a trocar with canula of a medium size, not too small, otherwise the glycerine solution will not run readily through the canula.

6. The parts must be carefully handled and protected by the nurse, and the injection repeated, if required.

P. S.—At the Edinburgh meeting, in August last, Professor Pirie of Aberdeen drew my attention to a wet preparation of a similar case, in which the cord passed through the sac, and was attached to the outer wall of it.

It will be perceived that cases VII., VIII., and IX. are here referred to, though not in detail. Case VII. was treated by myself, the history of it resembles those already given, and a figure of it will be found opposite page 55. Case VIII. will be more fully given for reasons to be stated, while the other was one of Dr. Watt's.

Case X.

The following is Mr. Burton's case, as narrated by himself.

On September 16 I was asked to see a child, born the day before, and said to be "not right." On examining the child, it appeared to be a feeble, not well nourished infant. It had a large fluctuating tumour over the last dorsal and two upper lumbar vertebrae. The legs and feet were much deformed, there being talipes varus of both

feet, while both legs and feet were rotated ninety degrees outwards, principally through unrestrained action of the sartorius. Both legs, and especially the right, were flexed on to the belly, by unrestrained action of the rectus. There was paralysis of the lavatores ani, so that the natural fold of the buttocks was wanting, and the anus appeared as a slight protuberance on a tolerably smooth rounded surface. There appeared to be paralysis of all the muscles of the backs of the legs and thighs, and tickling of the soles of the feet gave rise to no movements. Faeces appeared to be constantly escaping from the rectum, as the surface of the tumour gave signs of irritation from friction; and, as there were no likelihoods of the child becoming stronger, I decided not to postpone the operation of injecting the solution of iodine in the manner successfully followed out by Dr. Morton.

On the 18th, in company with my friend Mr. W. H. Moore of this town, I drew off three drachms of clear fluid, and, taking great care that the needle should not cross the middle line, lest it should come into contact with the spinal cord, I then injected half-a-drachm of Morton's solution. Neither part of the operation seemed to give much pain. The child cried a little just as the fluid was being injected, but stopped as soon as the needle was removed; and, after laying on a pad of carded cotton, kept *in situ* by means of a soap plaster, it was put to the breast, and sucked well. I ordered fifteen drops of brandy every three hours. On the 19th I was told that the child had not been well, that it had sucked once only during the night. The tumour had partly refilled. The eyes were fixed and convulsively drawn down, the arms were rigidly extended forwards, and the hands clenched; whilst the

child started convulsively on the slightest noise or movement. I ordered two grains of bromide of potassium and four minims of tincture of hyoscyamus in water every four hours. On the 20th, the child had not sucked since I saw it last, and was in severe convulsions. I had it turned on its belly to look at the tumour, which was in about the same state as on the preceding day, and when it was turned back it had ceased to breathe.

It will be observed that this was an unfavourable case for operation, as paralysis was so general; however, no better result could be looked for by letting it alone, and, as the operation had been so successful, it appeared to be the only means of doing it any good. No *post-mortem* examination was made. I have thought it my duty to report the case, as the subject of the treatment of this complaint by injection of iodine

is now under discussion, and the method has up to this time met with uninterrupted success.

CASES XI.-XIII.

Notes of three Cases of Spina Bifida treated by Iodine Injection, by J. H Ewart, Surgeon to St. Mary's Hospital, Manchester, and published in the Liverpool and Manchester Hospital Reports.

Spina bifida until quite lately has been looked upon as an almost incurable disease, and surgeons have, as a rule, preferred doing nothing to running the risk of causing death by operative interference. Our text-books, too, advocate the same cautious "do nothing" treatment, and merely name the various plans of treatment that have been employed, only to be followed by various objections to each of them. The profession have therefore much to thank Dr. Morton for, in having revived in a modified form the treatment of spina bifida by iodine in-

jections, and also for the clear manner in which he has stated the results of his operation. As his cases, or rather their treatment, has called forth some criticism, I think the following reports will not be without interest, and will add a certain amount of evidence to that already adduced in favour of the method Dr. Morton advocates. The solution used consisted of

Iodine grs. x, Pot. Iodi. grs. xxx, Glycerine ℥j.

Case I.—The child, one day old, was brought to St. Mary's Hospital on 29th Oct., 1874, suffering from spina bifida situated in the lumbar region. Nothing was done at the time, and the child was seen again on the following day, when the tumour was tense and the surface ulcerated. A fine canula was introduced, and some pale straw-coloured fluid drawn off, and a pad applied.

November 4th.—Tumour refilled, surface ulcerated. At this time the measurements of the tumour were as follows: long diameter $1\frac{7}{8}$ in.; transverse 2 in.; circumference $2\frac{1}{2}$ in.; the lower border of tumour $1\frac{1}{2}$ in. from anus. The tumour was punctured at its lowest part, and about half-an-ounce of pale fluid, almost white, drawn off. It was intended to inject half-a-drachm of Dr. Morton's fluid into the sac, but, owing to a defect in the syringe, and the thickness of the fluid, not more than fifteen minims found its way into the sac. The injection seemed to cause no inconvenience, but I should add that no nerve structures could be demonstrated in the sac.

6th. — Tumour partially refilled, feels harder, especially at and around the point of puncture. Canula again introduced, and half-an-ounce of deep straw-coloured fluid withdrawn. Thirty minims of Morton's

fluid were injected into right side of tumour, and no bad result followed.

11th.—The mother states that the child was convulsed for half-a-day after last operation.

13th.—Child seems perfectly well, tumour harder.

27th.—Thirty minims again injected.

December 3.—After last injection the child was slightly convulsed; ulcerated surface healed; tumour feels more solid. Injection repeated.

January 6th, 1875.—Lower part of tumour consolidated and shrivelled; upper portion of skin thin and distended; the canula was introduced at this point, and some thick gelatinous fluid escaped. Thirty minims of solution injected.

16th.—Tumour firmer; a small portion of skin in centre ulcerated; applied on lint a saturated solution of tannin.

June 10th.—Since last note nothing has been done to the tumour beyond applying the tannin to ulcerated surface; the tumour is quite hard, pressure on it causes no pain; the child's lower limbs seem properly developed, and reflex action is present.

October 23rd.—Child was seen to-day, having been in the country since last report. Tumour is quite firm, the upper part being somewhat prominent; the child's legs seem weak, and it has slight talipes varus of both feet; this condition of the feet had hitherto escaped my notice, but the mother states that it has existed since birth.

Case II.—A healthy-looking female child, one day old, was brought to St. Mary's Hospital on the 16th January, 1875, suffering from spina bifida. The mother is twenty-three years of age, the child her first; she went her full time, and had a

natural labour, lasting seven hours. The tumour is situated in the lumbar region, and is soft and fluctuating (instead of tense as in Case I.), is broader at its upper part, and hard lower (shaped like the heart in a pack of cards, without the notch), and measures transversely two and a-half inches, longitudinally two inches. The tumour was tapped on right side, and three drachms of highly-albuminous fluid withdrawn; half-a-drachm of Morton's fluid was injected, and with no apparent discomfort to the child.

January 20th.—Skin over the tumour considerably thickened; child has experienced no inconvenience from previous tapping, which was therefore repeated, and two drachms of fluid withdrawn, half-a-drachm of Morton's fluid being substituted.

27th.—No ill effects from the previous proceedings; tumour decidedly firmer; sur-

face ulcerated; injection, and lint soaked in tannin solution applied.

February 10th and 17th.—The child was seen on both Tuesdays, but nothing done beyond paying attention to the superficial ulceration of the tumour.

20th.—The ulceration has healed; base of tumour contracted and puckered; apex fluctuating, and skin thin; at this point it was punctured, but no fluid escaped, and ten minims of Morton's fluid were injected.

June 3rd.—Since last note the tumour has not been touched; the child was seen to-day, the first time for two months, and found suffering from hydrocephalus. The mother states that her child was quite well a fortnight ago; the tumour is hard and contracted, and resembles a puckered scrotum.

4th.—The child died. No regular *post-mortem* could be obtained, but the lower

part of the spine was removed for examination. I regret to say that the gentleman who kindly undertook the examination of the specimen has been prevented by pressure of work from completing his task. I hope, however, at some future time, to place the result of the examination on record.

Case III.—On June 23rd, 1875, a female child, one day old, was brought to St Mary's Hospital with spina bifida. The mother states that this is her fifth child, the four preceding ones being perfectly healthy. The tumour occupies the lumbar region, and is flat except at the upper part; skin very thin, the superficial veins large; tumour measures one and a-half inches both ways; reflex action is wanting; tickling the feet produced no movement; tumour had been ruptured, probably in the labour, and fluid

was exuding; a canula was introduced on left side of tumour, and half-a-drachm of Morton's fluid injected, without any apparent inconvenience to the child; a compress of lint soaked in tannin solution applied.

June 25th.—Child seems perfectly well; moves its legs. Tumour firmer; no oozing; dressing re-applied.

30th.—Child reported as being restless; seems well. Tumour firmer; surface ulcerated; dressed with zinc ointment.

August 10th.—Since last report the child has been seen several times, and dressing of zinc ointment applied; child has been perfectly well; tumour is quite hard, and level with the surrounding skin; has very little improvement in legs; holds them abducted and crossed as in uteri. The child died suddenly the same day at 10 p.m., in convulsions. No *post-mortem* allowed.

Out of three patients, therefore, two died, and, even allowing that the treatment caused death, the success of the one case, and the almost hopelessness of a spontaneous cure in spina bifida, would, to my mind, justify the operation.

But was the operation, or the effects of the operation, in either case the cause of death? I think one may answer in the negative. Surely the length of time that elapsed between the last operative interference (five months in the one case and six weeks in the other) would put this out of the question; moreover, Case 2 died of chronic hydrocephalus, which disease, we are told, is a frequent complication of spina bifida. In the *Lancet* of 16th October, 1875, Mr. West of Birmingham reports a case of meningocele associated with spina bifida, which he cured by simple tapping, no injection being used; the child died some

months afterwards of chronic hydrocephalus, and Mr. West considers that the means employed for the cure had no part in producing the morbid condition which caused death, and in this opinion I think all must concur.

The exact cause of death in Case 3 is uncertain. The child was seen on the day of its death, and showed no appearance of disease; had the treatment contributed to the fatal result, this would, I think, scarcely have been the case.

So, granting my conclusions to be correct, the three cases now reported really amount to three cases of spina bifida cured by injection of iodine solution. And this brings me to the question of the solution to be used. The ordinary tincture of iodine has hitherto been the fluid generally employed, but the results with this have been far from satisfactory. Is the spirit in the tincture

the cause of failure, as it differs materially only in this respect from Dr. Morton's fluid? Holmes, in his *Diseases of Children*, relates a complicated plan of injection made use of by Brainard, of Chicago, in seven cases, the solution used being composed of

Iodine grs. v, Pot. Iodi. grs. xv, Aqua ℥i ;

and Brainard claims success in all the cases not associated with hydrocephalus, namely three. The same author tells us that M. Debout cured five cases out of ten with Velpeau's solution (one part of iodine, one part of iodide of potassium, and ten parts of water).

Dr. Morton's solution will be seen to differ from Brainard's and Velpeau's in the quantity of iodine used, and the article (*? solvent*) employed, and its only drawback is its thickness, causing a difficulty if a small canula be used. This trouble occurred to

me in Case I.; but I see that Dr. Morton, in a communication read at Edinburgh before the British Medical Association, especially points out this inconvenience, and advises the use of a medium-sized canula.

Then, as to the child's state of health, and the age at which the operation may be undertaken. Dr. Morton says, "The child should be in a thriving condition." May I suggest that the time for operation would depend more upon the state of the tumour than upon the state of the child's health? A very tense tumour, or one already ruptured, should surely be treated at once; and I would advocate the same expedition in all cases, seeing how easily the tumour might be ruptured, and the disastrous effects of any great quantity of cerebro-spinal fluid escaping. Indeed, Dr. Morton owes the death of what would probably have been a successful case to this very cause, and I

found no bad results from the early treatment of my cases.

Is a tentative puncture necessary? I think not. It may be useful, to prevent the rupturing of a tense sac, and for this reason was resorted to in Case No. 1, as no solution was at hand. The plan I have adopted is to puncture the tumour at its side with a fair-sized trocar and canula, allow the sac to empty itself to a certain extent, and then, with a syringe fitting the canula, inject the fluid. This method is simple, and requires only one puncture.

The number of times that the operation is to be repeated is also of some moment, as each additional puncture must to some extent increase the risk to life. Looking over the reported cases, I find only once was it considered necessary to repeat the operation more than twice; once often sufficed.

These facts, and the success of my third case with one injection, have forced upon me the conclusion that my six punctures in Case 1 was an excess of zeal, and in future I shall certainly pause a longer time than I have hitherto done before repeating the injection.

These three cases bring the number treated by Dr. Morton's method up to thirteen. Out of these, *eight* are reported as cured and living, and in good health; *two* cured, but dead from causes not connected with the operation; and three died whilst under treatment—a total result most encouraging.

Nothing can be more gratifying to me than to learn of the success of this treatment in the hands of others; and though these remarks of Dr. Ewart are somewhat laudatory, I trust that my repetition of them

will not be ascribed to that quality alone. I regard them as worthy of quotation, because the criticism which he offers is extremely fair, and is such that, I am glad to say, I can concur in the whole of it. With a view to the ultimate success of the case, it is important that the child should be in a thriving condition; but, when immediate danger threatens from the condition of the tumour, it is quite proper to give the child the chance of being saved. In advocating a new mode of dealing with spina bifida, it seemed to me to be a right thing to define narrowly the characters of cases likely to prove successful, and to do this in such a way as to lessen the chances of discredit being brought upon our proceedings, by attempting the cure of cases otherwise hopeless. This was the line of reasoning pursued in my own mind when writing and speaking on my earlier cases. The tentative punc-

tures I have now abandoned as unnecessary, and at first they were used as feelers, to make sure that interference would be tolerated. From what I have already seen, I am satisfied that one injection will frequently prove sufficient.

Case XIV.

Case of Spina Bifida, treated by the Iodo-Glycerine Solution, and published in the "Lancet" of December 2, 1876.

In the beginning of September last (1876) Dr. Milroy of Kilwinning informed me by note that, a few days before, he had attended at the birth of a child, which was the subject of spina bifida in the lumbar region, and wished to know when it would be proper to operate upon it. To this the reply was, that it would be well to allow the child to be fairly over the accidents of birth, unless there was reason to fear the speedy bursting

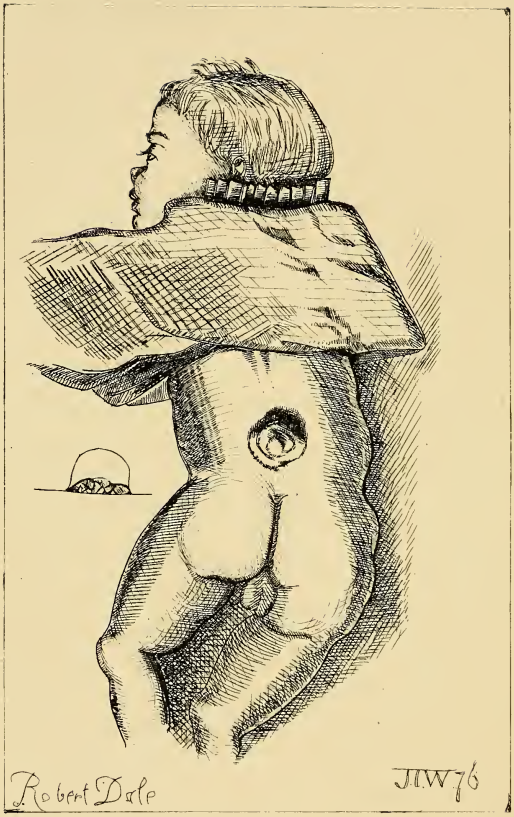
of the tumour, and the consequent draining-off of the spinal fluid.

When nearly a fortnight old, the child was brought to Glasgow, to be under my care, and this was then done from a fear that an ulcerated or abraded surface on the most prominent part of the tumour, might possibly result in perforation of the sac, and escape of the fluid, which is known to be so fatal. This abraded surface was more than an inch in diameter.

On the 14th September, I saw and examined the tumour, and on the day following, operated on it by puncture and injection of the iodo-glycerine fluid, which I have used and recommended for such cases. As the sac was neither very large (the size of an ordinary peach) nor very full, little escape of the serous fluid was permitted, and about half-a-drachm of the iodo-glycerine solution was injected. Collodion was, as usual, ap-

plied to the opening, and over that a square inch of lint dipped in collodion, which effectually closed the wound. No disagreeable symptoms followed; the sac seemed in part to solidify, and soon appeared to be about half the size it was previous to the operation.

Watching it from day to day, it did not seem to shrink readily, or so quickly as I could wish, and on the 26th September it was again punctured and injection attempted. The size of the swelling at this time was so much reduced, that I was very cautious in pushing the trocar into it, and the canula had so little hold and space, that it slipped out when I tried to inject a little of the solution by placing the nozzle of the syringe in the opening, but I suspect that very little, probably only a few drops, obtained admission. Collodion and lint were applied as before. Next day the whole tumour seemed slightly inflamed, and from that date



The small Figure shows an Outline of the Tumour before Operation.

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has continued gradually to solidify. By the 4th or 5th of October the abraded surface had completely healed, and on the 12th the parents were permitted to return with the child to their home in the country.

It occurred to me that collodion might aid in producing, or favouring that corrugation of the skin which is known to take place in favourable cases, and a piece of lint covered with it was laid over the tumour. Whether this expectation may be well founded, we cannot at present say, but the application is sufficiently safe, and, indeed, somewhat protective.

The following is, in substance, the report of it sent to me on the 24th October:— "Child well, tumour shrunk a good deal. Has a thick cord of skin, a little raised, all round it. There is still about the breadth of a shilling of thin bluish-coloured skin covering the centre of it, but it feels firm

to the touch underneath, and is nearly quite flat."

This is now the fourteenth case of spina bifida (of which we have any account) which has been subjected to treatment by injection of the iodo-glycerine solution, and of these eleven have proved successful. In all the lumbar cases which I have treated it has been uniformly fortunate, and lumbar cases are known to be much more numerous than dorsal and cervical put together.

Case XV.

Treated by Dr. Berry of Wigan, and published in the "Lancet."

Sir,—On February 9, 1876, Mrs. C—— was delivered of a male child, which had spina bifida in the lumbar region; the skin over it was quite firm, and a cure was attempted by strapping and sheet-lead as a

pad. This plan failed. I resolved to treat it by injection with the iodo-glycerine solution of Morton.

May 3rd.—Child now three months old; tumour larger and conical, having a circumference at the base of seven inches, and from base to apex a height of one inch and a-half. I introduced a small trocar, drew off about four drachms of serous fluid, injected about one drachm of the solution, and sealed the small opening with a pledget of lint and collodion. The child was somewhat restless, and cried at times during the night, although there was very little fever. The tumour seemed to get more tense for a few days, and the walls more solid.

14th.—Tumour smaller. I drew off from half-an-ounce to six drachms of fluid, and repeated the injection.

21st.—Tumour smaller; feels more solid

at the base. I drew off about four drachms of fluid, and repeated the injection.

31st.—Tumour is much smaller; communication between it and the cord closed, for it cannot be emptied by pressure, and when the child cries there is no perceptible increase. I again drew off about four drachms of fluid, and re-injected the tumour.

July 20th.—The tumour is solidified, and has shrunk to about one-fourth of its original size. It will, I have no doubt, shrink more; but the cure may be said to be complete, as there is no communication between it and the membranes of the cord.

The child is of poor stamina, and is brought up with the bottle. This artificial feeding appears to upset its stomach every now and again, for it suffers periodically from vomiting and purging.

The child died from marasmus on the 29th of September. At the time of its death the skin was a little prominent over the seat of the tumour. The cure was, however, perfect.

Remarks.—This adds another to the number of cases cured by injection. The case was a favourable one for operation, with the exception of the child's stamina; but, in my opinion, the majority of cases suffering from this affection are children of low vitality. I see, on perusing Dr. Morton's case in your issue of December 2nd, he did not withdraw any fluid; and in any future case I might have I should adopt the same plan, only seeking to solidify the contents, and allow the tumour to shrivel up, thus rendering repeated tappings unnecessary, as well as ensuring more safety, the iodo-glycerine solution being less likely to come

into immediate contact with the nerve-branches.—Yours obediently,

WM. BERRY, M.R.C.S., ETC.

WIGAN, *December*, 1876.

REMARKS.—If any apology is necessary for giving these cases in full, it may be found in this, that by so doing the history of this attempt to bring this dangerous malformation within the scope of curability will be more readily and more fully placed before the profession.

It will be seen that for many years I, like others, regarded the defect as beyond remedy, and necessarily fatal, although very rare instances of prolonged existence and spontaneous closure were to be found on record.

It will also be remembered that in my first cases tentative punctures were em-

ployed, indicative of a fear and caution not altogether to be regretted, especially in first trials of a new procedure.

This mode of treatment so recently adopted, and exemplified in the preceding cases, and the results of the experience acquired in their management, may be thus described:—

1. *Protection.*—When an infant is safely ushered into the world presenting a swelling of the kind under consideration, some kind of defence is absolutely necessary to protect it from injury. Were it only to save the child from pain, this would be advisable, but it becomes imperative when we remember that the continuance of the infant's life would be imperilled by undue pressure, or by any force which might cause the thin integuments to give way. These defensive means usually consist of a layer of carded cotton wool, and some cup-shaped shield, made of

a substance more or less resisting, such as leather, card-board, wood, tin, or lead. A padded binder is put over all. Frequently the inventive powers of the attendants, stimulated by necessity, supply some useful addition to suit the case under their charge. As soon after birth as may seem prudent, the operation may be performed; when the child is well, a fortnight may be allowed to elapse, but an earlier day may be chosen if circumstances demand it.

2. *Puncture.*—It may have been observed that in my first cases a tentative puncture was made, and for the following reasons:—Like others, I regarded interference in such cases as extremely hazardous in itself; and was not then certain of being able to close the punctures as now done with collodion; besides it was thought not unlikely that alarming symptoms, such as convulsions, might be an immediate consequence. Hap-

pily these fears were not realised, and experience has proved to me that tentative punctures were not required, so that, in favourable cases, I now proceed at once to pierce with trocar and canula, and inject.

3. *Seat of Puncture.*—I select a spot slightly to one side of the middle line, and as near the upper part of the tumour as may be possible, that is, where there is an available space. By so doing I hope to avoid the cord, which is often in the middle line; and I imagine that an aperture in the upper part of the tumour is more easily closed, and less likely to reopen and give occasion to oozing, or loss of the spinal fluid.

4. *Means of closing puncture, and mode of applying such.* — Collodion and collodion flexile have both been used, and both seem to answer the purpose, but the former has been most frequently employed. When

withdrawing the canula with the one hand, I grasp the opening with the finger and thumb of the other, trying to leave the edges so exposed that an assistant, who is in readiness, may touch them thoroughly with a camel's hair pencil dipt in the collodion, and I contrive to hold steadily for a few seconds, to give the collodion time to fix. This often succeeds, but, if not, a square inch of lint may be liberally smeared with collodion, and laid upon the opening, still held as before for a short time, and by this procedure I have never failed to close the aperture. A soft dressing or covering is then applied, such as dry lint, or, if there has been any abraded surface, lint dipt in olive oil, covered with oiled silk, or gutta-percha tissue, and over these a little carded cotton wool, and any protective appliance previously formed to suit the parts.

5.—*Time to wait before re-injecting.*—

This, I confess, has often been to me a matter of doubt, but, as I am now satisfied that one injection will frequently prove sufficient, it will be right to wait for a few weeks, provided there is every appearance that nothing is going wrong, nor likely to do so under ordinary circumstances. This allows time for the shrinking of the swelling. It must be remembered that all operations are sources of danger, and to this the injection of spinal tumours is no exception. When, however, failure, either complete or partial, becomes evident, a second operation may be undertaken, and a third or fourth, or greater number if required.

6. *The fluid injected.*—From its composition, this is now called the "iodo-glycerine solution." The reasons for adopting this solution have already been given in the remarks appended to Case I., the chief of these being that, from its comparative den-

sity, it was considered likely to prove less rapidly diffusible than a watery or spirituous solution of iodine, and in that I have not been disappointed. This greater comparative density or viscidity necessitates the use of a trocar and canula of a medium size; it must not be too fine, otherwise the injection will not run. The strength of the solution has already been given more than once, and it has not seemed to be too strong, while in a case which will be found in the appendix, it will be seen that on one occasion I used an iodo-glycerine fluid of double the strength which I have usually employed.

The statistics of the cases subjected to this plan of treatment. so far as known or recorded, are these:—Fifteen cases in all, of which twelve have been successful, and three unfortunate. All my own lumbar cases have been fortunate. Of the three

cases which died, one was the case of a child hopelessly deformed and paralysed, a class of cases as yet completely beyond the resources of the professors of the art of healing; another (Dr. Watt's third case) died from causes altogether unconnected with this special deformity; while in the case of the third, which is given in the appendix, because it presents several points of interest, it was not conclusively ascertained whether it was a true case of spina bifida, or case of encephalocele, situated, as it was, high in the cervical region. I will be pardoned for adding, that the success of this mode of managing the cases of this dangerous malformation has far exceeded my most sanguine expectations.

As to the state of the parts anatomically after a successful operation, nothing can at present be known with certainty, since no opportunities of *post-mortem* examinations

have presented themselves. There is every reason analogically to suppose that the aperture in the spinal canal becomes closed, either by fibrous tissue or by cartilage and bone, after the shrivelling of the tumour. We know nothing of the condition of the nervous contents, though I fully expect that by and bye we shall be able to throw light upon these points.

Cases to which this operation is adapted. —These may be divided into two classes, namely: 1st, cases in which a complete and permanent cure may be reasonably expected; and 2nd, cases so complicated by other defects as to seem hopeless. Of the first class it may be said that there must be no paralysis either of limbs or sphincters, and no other deformity of importance. Apart from the presence of the tumour which constitutes a spina bifida, the child ought to be sound, and, if possible, thriving. Should anything

be amiss, a few days careful treatment may be necessary before an operation is proceeded with.

In the second, or complicated class of cases, a variety of conditions may be met with, some almost necessarily fatal, and some apparently beyond remedy by any of the resources of surgery at present known. Paralysis of the lower limbs I regard as a very serious complication, though it does not entirely exclude hope of benefit from operation; the prospect of survival is slender, unless the family circumstances are such that every care and appliance can be commanded. Paralysis of the anal sphincter is not a fatal complication, but a very disagreeable one, for which we have no remedy. Very recently a girl, of the age of five years, was shown to me suffering from this defect, for which only palliative means could be recommended. Then, again, hydrocephalic cases are still

more hopeless, though even in such, injection has been tried, but unsuccessfully. Teratologists describe a variety of such hydrorachitic malformations, many of which would render futile any such operation as I have tried and recommended.

In children of the former class, the operation may be undertaken and recommended, at least in lumbar cases, with very little fear of an unfavourable result.

APPENDIX.

In relation to the cases previously given, the following remarks of others on certain cases of greater deformity than usual are possessed of some interest, while the case of the child Wilhelmina George presents features of its own, which renders its publication instructive, and consequently desirable.

MANSER'S CASE.

In the *British Medical Journal* of March 20, 1875, Dr. Morton, referring to Mr. J. E. Burton's case of spina bifida, reported in

the *Journal* of the 13th March, says: "It belongs to a class of cases all but absolutely hopeless, in which the lower limbs and lower part of the trunk of the body are paralysed, and the infants usually die in a few days. Instances of longer survival are rare indeed, and I am not aware that there are any on record in which the paralysis was so very extreme as in Mr. Burton's case."

I have at the present time under my care a case precisely similar to the one described by Mr. Burton, and the child is now eleven weeks old. It was born on December 7, 1874, and was a healthy-looking and well-made female child, down to the seat of the cleft in the spine.

Over the upper two lumbar vertebrae was a fluctuating tumour about six inches in circumference, having a well-marked pedicle. The tumour had two small superficial ulcer-

ations, from which a thin ichorous discharge exuded; the remainder of its surface was covered by a somewhat dense opaque-looking integument. There was talipes varus of both feet, the plantar surfaces being accurately opposed to one another, and quite flat and smooth, as if they had been kept in perfect apposition during the period of gestation.

Both legs were flexed upon the abdomen, and had an arched appearance with the concavity towards the abdomen. There was no appearance of the natural fold of the buttocks or of the popliteal space. The whole length of the legs, from the tuberosities of the ischia to the heels of the feet, presented a smooth unbroken convex surface. There was paralysis of the sphincter ani. This state of things continues. I did not consider the case at all fitted for operative interference, and in this my partner, Mr. Marsack, concurred. At the present

time the tumour and the lower limbs are much in the condition I have here described. There has been no increase in the size of the tumour, rather a diminution.

The child for the first month appeared to thrive; since then, it has gradually wasted, until now it is quite a skeleton. There have been no convulsions, but it has suffered severely from eczema of the head, face, and trunk. The surface of the tumour has continued to give forth a thin and sometimes offensive discharge. This case appears to be in all respects similar to Mr. Burton's, except that my patient has no rotation outwards of the legs. I could not see any object in attempting to cure the spina bifida, as there appeared to be no prospect of relieving the distorted and paralysed lower limbs; and I felt, as did also the parents, that the sooner the poor little deformed creature quitted this world the better.

Probably the injection of iodine, as in Mr. Burton's case, would have expedited matters, but possibly it might have prolonged the child's life, which was not an issue to be desired.

FRED. MANSER, M.R.C.S.E.

TUNBRIDGE WELLS.

LISBON CASE.

At the meeting of the Lisbon Society of Medical Sciences, on February 17th, 1872, Dr. Camara Cabral communicated a case of congenital spina bifida which he had successfully treated. The patient was a child aged twenty-five days, which was brought into the St. Joseph Hospital on 21st November. It had in the lumbro-sacral region a swelling 40 centimeters in circumference, 17 in vertical and 10 in transverse diameter,

and 6 in depth. It fluctuated, was transparent like a hydrocele, and appeared to contain not only fluid, but some solid body. Pressure on it did not produce any convulsions, nor were there any paralysis or other symptoms denoting lesion of the spinal cord. It was therefore concluded that the tumour consisted exclusively of a hernia of the meninges, filled with fluid. On the 29th it was tapped with a Dieulafoy's trocar, and 400 grammes of a transparent yellow fluid, containing an abundance of albumen, were removed.

Compression was applied by means of adhesive plaster. No symptoms followed the operation, beyond some vomiting and loss of appetite. Some days later, the tumour having again enlarged, 250 grammes of liquid were removed, and on December 14th 425 grammes. The defect, which was found to be in the situation of the fourth

and fifth lumbar vertebrae, was gradually diminishing. On a fourth and a fifth occasion puncture was performed at intervals of some days; the quantities evacuated being respectively 175 and 125 grammes, and the fluid being more highly albuminous than before.

After the last two operations there was some meningitis, which yielded to ordinary remedies. The child made a good recovery, and was exhibited at the meeting at which the case was described.

O Correio Medico de Lisboa.

March 1*st*, 1872.

CASE OF SPINA BIFIDA?

Williamina George, aged eight weeks, was admitted on the 15th November, 1874, into Ward 28 of the Glasgow Royal Infirmary. At the upper part of the posterior cervical

region, and near the occiput, a tumour is situated, which at birth was loose and flaccid, and containing little or no fluid, but in the course of a few weeks the fluid gradually increased in quantity, until now the tumour, which is of a globular form, measures nine inches in circumference, and is apparently capable of containing from six to eight ounces of fluid. It possesses a peduncle, the circumference of which measures about four inches. The skin over the tumour is healthy-looking, and has no appearance of impending ulceration. As the child is suffering from cough, it is considered prudent to delay operation for a few days.

November 25th.—The tumour was punctured to-day and about two ounces of fluid drawn off.

December 1st.—Tumour was again punctured and about the same quantity of fluid drawn off as on the previous occasion, and

SPINA BIFIDA — Dr. Morton.

Wilhelmina George

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a little of the following solution was then injected :—

℞ Iodi grs. x ; Potas. Iodidi grs. xxx ; Glycerine ʒi.

December 7th.—Child doing well; tumour measures eight and a-half inches in circumference.

December 15th.—Tumour tapped, and one and a-half ounces of fluid withdrawn, then injected with a little of the above solution.

December 17th.—Child pretty well, tumour a little swollen and tender to the touch.

December 29th.—Tumour was punctured to-day, and five drachms of a reddish fluid removed, and a portion of the iodo-glycerine solution then injected. Dr. Morton, being dissatisfied with the quantity of the solution injected through the canula, withdrew it, and, inserting the nozzle of the syringe, in-

jected freely into the tumour, which has been getting solid and less tender to the touch.

December 31st.—Allowed to go home, to come back in a week.

January 6th.—Tumour more solid, looking well, still a little translucent.

February 15th.—Domestic affairs having required the presence of the mother at home, the tumour has not been seen till now since the 20th January, when it was looking well. It has increased in size, being now ten inches in circumference, and round the pedunele five and a-half inches. The child has been thriving well, and its general health has been unaffected by each operation. This morning the tumour was punctured for the fifth and injected for the fourth time, about three ounces of fluid were removed, and two drachms of the iodo-glycerine solution injected.

February 16th.—Child doing well, sucked vigorously, and rested well during the night. The tumour is considerably inflamed, and tender to the touch; left the Hospital to-day for home, its mother promising to bring it back on the 23rd curt.

February 23rd.—To-day the tumour is very much inflamed. Dr. Morton punctured it and drew off six ounces of fluid, and then injected two and a-half drachms of the iodo-glycerine solution.

March 1st. — Tumour still translucent; to-day three ounces of fluid were drawn off, and three drachms of a solution exactly double the strength of that previously used was then injected. The fluid drawn off was tested for sugar in the following manner:— A quantity of Fehling's solution was boiled in an ordinary test tube for the purpose of ascertaining whether it was reliable or not; the result being satisfactory, a few drops of

the fluid was then added, and the whole boiled, when the characteristic reaction indicating the presence of sugar was obtained. This was afterwards confirmed by Professor Ferguson of the University of Glasgow.

March 10th.—The tumour was tapped to-day and more than three ounces of fluid removed; a seton medicated with the iodo-glycerine solution was then introduced. The patient apparently suffered little, and was sucking vigorously ten minutes after the operation, and remained so well that on the 13th March the child was allowed to be taken home.

March 14th.—On awakening this morning at 8.30 the mother found the clothes of her child literally soaked with fluid that had escaped from the tumour. She brought the child to the Infirmary at 10.30 a.m.

Collodion and resin plaster were applied, but failed to control the escape of the fluid,

which ceased for a while after applying lint soaked with collodion.

Child much exhausted, and had a convulsive fit.

March 15th.—Child calmer than yesterday, but extremely weak, and continuing to sink, died at one p.m.

Remarks.—Every justifiable effort was made to procure a *post-mortem* examination, but in vain, as the mother persistently refused. This is much to be regretted, as by this alone could it be ascertained whether the sac communicated with the spinal canal, or with the cranial cavity; if the latter, then it would be called an encephalocele. The large quantity of fluid withdrawn is worthy of remark; it could not be less than 25 or 26 ounces. Upwards of 21 ounces were actually measured, and at every operation there was an escape of a portion uncaught and unmeasured, so that 25 or 26

ounces may certainly be considered within the mark.*

Four times was it injected with iodo-glycerine solution of the strength usually employed, and once with a solution of double the usual strength, and none of these injections seemed to cause any injury, not even a disagreeable symptom, yet none of them seemed effectual in causing shrinking of the cyst or tumour. So many failures naturally produced a little impatience, and strengthened my desire to succeed, and as such free handling had done no harm, I was tempted to think of a seton, and used it. This I now regard as an error, and is named chiefly to counsel its avoidance in future. Still, even the seton did not, as such, do any mischief; it was the drain of cerebro-

* It will be observed, however, that this was a gradual abstraction; it is probable that even half this quantity drained off at once would have proved fatal.

spinal fluid that prostrated and killed the child, thus furnishing another proof, if that be wanted, of its baneful consequence. Had this child been retained under such surveillance as we find in an hospital, it might have been saved.

The following remarks of Mr. E. N. Smith of Paddockhurst may be added, indicating, as they do, the fears which long prevented me, and still prevent others, from operating:—

SPINA BIFIDA CURED BY INJECTION.

With regard to Dr. Morton's successfully treated case, reported in the *Journal* of October 24th (1874), I venture to suggest that a few more particulars would be very interesting, more especially as so little is known of the usual contents of the sac, when this malformation occurs in the upper

portion of the spinal column. Will Dr. Morton kindly inform us, whether the cord in his last case communicated with the sac? This, no doubt, is a very important point, and one which seems to have been difficult to diagnose in some reported cases. In the lumbo-sacral region, the cord is nearly always attached to the sac. Mr. Prescot Hewett examined twenty preparations, in only one of which this was not the case. Mr. Holmes (*Surgical Diseases of Children*) has alluded to the importance of an examination of the contained fluid in any doubtful case: "When the cord is involved, the subarachnoidean fluid will be present. . . . In any doubtful case, the presence of sugar, or of a seemingly like substance, is a strong proof of the spinal origin of the tumour; but, upon the other hand, its abscence or the presence of much albumen does not show that it does not belong to

the spinal fluid cavity. In the latter case, however, it may be allowable to conjecture that its communication is with the arachnoid cavity, and that there is less probability of finding the cord in the sac." In drawing conclusions as to the advantages of any mode of treatment, it must be desirable to know the exact nature of the cases treated, and I expect that some of the cures of which we possess the reports, were cases in which the spinal cord was not attached to the sac. M. Debout (referred to in Mr. Holmes's *System of Surgery*) states that Brainard cured five out of six cases; whereas Brainard himself only alludes to three cures out of seven; but neither seems to have made any record with regard to the contents of the sac. At Lisbon (reported in this *Journal*, March 23rd, 1872) Dr. Cabral cured a case, in which he describes the fluid which was removed as being highly al-

buminous; and he further stated that there was neither paralysis nor any other symptom denoting lesion of the spinal cord. I think that all who are interested in these cases would like to know Dr. Morton's opinion upon this point. Cases in which the cord is not attached to the sac are so rare (Mr. Prescott Hewett, etc.), that it is very unlikely that four instances should occur in succession. But, on the other hand, it seems to me that, if the spinal cord were extensively attached to the posterior portion of the sac, any operation which should cause the sac to contract and shrivel up would necessarily produce serious mischief to the contained nervous matter.

(Signed) E. Noble Smith.

Paddockhurst.

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